



SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B. Tech.

Branch: Civil Engineering

Semester: VIIIth

Academic Session: 2024-25

w.e.f - Date-02-09-2024

BCE081 Advance Structural Design –II (STEEL) Course Content

Course Objectives:

1. Understand and apply advanced principles of steel design, including limit state design and principles of structural mechanics.
2. Analyze the effects of different loads (dead, live, wind, seismic) on steel structures and apply appropriate design codes.
3. Examine specialized topics such as composite construction, steel bridges, and high-strength steels.

Unit–I

Plate girder bridges (Riveted and welded)

Unit–II

Trussed girder bridges for railways and highways (IRC & IRS holding). Bearings for bridges.

Unit–III

Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

Unit–IV

Chimneys: Guyed and self supporting steel stacks.

Unit–V

Bunkers, Silos & Towers

Course Outcome:

- CO1 Illustrate design of philosophies, analyze and design riveted and welded connection in steel structures. Analyze and design Plate girder bridges in steel structures
- CO2 Illustrate Design of Trussed girder bridges for railways and highways (IRC & IRS holding). Draw Cross section Bearings for bridges
- CO3 Analysis of Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom
- CO4 Analysis of Chimneys: Guyed and self supporting steel stacks
- CO5 Analysis of Bunkers, Silos & Towers

Reference Books :-

1. Design of Steel Structures – Ramammutham
2. Design of Steel Structures – Punia
3. Steel Str. by Ramchandra Vol II
4. Steel Str. by Arya & Ajmani
5. Design of steel structures – L.S. Negi



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BCE082 Geotechnical Engineering – II **Course Content**

Course Objectives:

1. The primary objective of this course is to equip the student with the knowledge of how to explore the soil,
2. Design the foundations for different conditions and check the stability of structures.

Unit–I

Shallow Foundations : Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

Unit–II

Deep Foundation : Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

Unit–III

Soil Improvement Techniques : Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness. Soil stabilization :Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical- stabilization and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

Unit–IV

oil Exploration And Foundations On Expansive and Collapsible Soils : Methods of soil exploration. Planning of exploration programmer for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

Unit–V

Sheet Piles/Bulkheads And Machine Foundation: Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications. Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

Course Outcome:

- CO1 To understand Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.
- CO2 Analysis for stability tilts and shifts, remedial measures. To understand Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils
- CO3 To understand Properties of soil affected by compaction. various equipment for field compaction and their suitability. Field compaction control. Lift thickness. Geo-synthetics, types, functions
- CO4 Illustrate methods of soil exploration. Planning of exploration programmer for buildings, highways and earth dams. Characteristics of expansive and collapsible soils, their treatment
- CO5 Illustrate Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, Modes of vibration. Mass-spring analogy, Natural frequency.

Reference Books:

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi
2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publications Delhi
3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.
4. Geotech. Engg. by C.Venkatramaiah-New AGE International Publishers, Delhi
5. Found. Engg. by Galeonards McGraw Hill Book Co. Inc.
6. Relevant IS Code

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BCE0831 Elective-V (1) Pre-Stress Concrete Design

Course Content

Course Objectives:

1. Provide a solid foundation in the principles of pre-stressing concrete, including its benefits and applications compared to conventional reinforced concrete.
2. Equip students with the knowledge of various pre-stressing techniques, such as pre-tensioning and post-tensioning, along with the relevant design methodologies.
3. Familiarize students with relevant design codes and standards governing pre-stressed concrete design, ensuring adherence to safety and performance criteria.

Unit-I

Introduction–Theory And Behavior: Basic concepts, Advantages, Materials required, Systems and methods of pre stressing – Analysis of sections, Stress concept, Strength concept, Load balancing concept, Effect of loading on the tensile stresses in tendons, Effect of tendon profile on deflections, Losses of pre-stress.

Unit-II

Design Concepts: Flexural strength, Simplified procedures as per codes, strain compatibility method, Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement, Limit state design criteria, Partial pre-stressing Applications.

Unit- III

Pre-Stressed Concrete Slabs: One way slab two way slabs, pre-stressed concrete beam slab construction, pre-stressed flat slab, Deflection and Crack Width : Factors influencing deflection, short term deflections of un cracked members, long term deflection, deflections of cracked members.

Unit- IV

Miscellaneous Structural Members : Columns subjected to combined bending and axial force, piles, poles, piers and abutments and Tension member-ring beams. Design of pre- stressed circular concrete tanks – Pipes

Unit- V

Pre-Stressed Concrete Bridges: General aspects – pre-tensioned pre-stressed bridge decks– Post tensioned post-stressed bridge decks – Principles of design only

Course Outcome:

CO1 Illustrate Basic concepts, Advantages, Materials required, Systems and methods of prestressing

CO2 Illustrate Limit state design criteria, Partial pre-stressing Applications.

CO3 Analysis of Design of pre- stressed circular concrete tanks – Pipes

CO4 Analysis of pre-tensioned pre-stressed bridge decks.

CO5 Analysis of Post tensioned post-stressedbridge decks

Reference Books :

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 1998
2. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co. Pvt. Ltd.
3. Rajagopalan, N, "Prestressed Concrete", Alpha Science, 2002
4. Jain & Jai Krishna, Plain & Reinforced Concrete Vol – II Nem chand & Bros Roorkee.
5. P. Dayaratran, Pre-stressed Concrete Structures, Oxford & IBH Co. Delh
6. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi, 1990
7. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
8. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete
9. IS 1343-980 code of Practice for Pre-stressed Concrete < Bureau of India Standards New Delhi



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BCE0832 Elective-V Traffic Engineering Course Content

Course Objectives:

1. Learn the fundamental principles of traffic flow theory, including the behavior of vehicles and pedestrians.
2. Acquire skills in data collection and analysis methods, including traffic volume counts, speed studies, and travel time studies.
3. Analyze the factors contributing to traffic accidents and develop strategies for enhancing safety.
4. Study the purpose, types, and effectiveness of traffic control devices, including signals, signs, and pavement markings.

Unit -I

Traffic Characteristics : 3E's of traffic Engineering, Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. Vehicular characteristics: Characteristics affecting road design-width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.

Unit -II

Traffic Studies : Spot Speed Studies and Volume Studies. Speed and Delay Studies purpose, causes of delay, methods of conducting speed and delay studies. Origin and destination Studies (O & D) : Various methods, collection and interpretation of data, planning and sampling. Traffic Capacity Studies: Volume, density, basic practical and possible capacities, level of service. Parking Studies: Methods of parking studies cordon counts, space inventories, parking practices.

Unit -III

Traffic Operations And Control : Traffic regulations and various means of control. One way streets- advantages and limitations. Traffic signals- isolated signals, coordinated signals, simultaneous, alternate, flexible and progressive signal systems. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals, pedestrian signals, flashing signals, clearance interval and problems on single isolated traffic signal.

Unit -IV

Street Lighting : Methods of light distribution. Design of street lighting system. Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. Different types of light sources used for street lighting. Fundamental factors of night vision.

Unit -V

Accident Studies & Mass Transportation : Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

Course Outcome:

- CO1 Illustrate the PIEV theory. Vehicular characteristics: Characteristics affecting road design- width, height, length and other dimensions. weight, power, speed and braking capacity of a vehicle.
- CO2 To understand Spot Speed Studies and Volume Studies. Origin and destination Studies (O & D): Various methods, collection and interpretation of data, planning and
- CO3 To understand Traffic regulations and various means of control. One way streets-advantages and limitations. Types of traffic signals, fixed time signals, traffic actuated signals, speed control signals,
- CO4 Analysis of street lighting system. Different types of light sources used for street lighting. Fundamental factors of night vision.
- CO5 Illustrate brief study of mass transportation available in the country. Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram.

Reference Books :

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi .Traffic Engineering by Matson, W.S.Smith & F.W. Hurd
2. G.J. Pingnataro, Principles of Traffic Engineering
3. D.R.Drew, Traffic Flow Theory
4. W.R. Mchsne and R.P. Roess "Traffic Engg"
5. Wohl & Martin, Traffic System Analysis for Engineering & Planner



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BCE0833 Elective-V Urban Transportation Planning Course Content

Course Objectives:

1. Explore the components of urban transportation systems, including roads, public transit, pedestrian pathways, and bike infrastructure.
2. Examine the policies, regulations, and planning frameworks that govern urban transportation.
3. Analyze successful transportation planning initiatives from various cities to identify best practices and lessons learned.

Unit- I

Transportation Planning Process: Definition of Study Area; Zoning Principles; Types of Surveys: Home Interview Studies, Commercial Vehicle Surveys, Road Side Interview Methods, Public Transport Studies, Land Use Inventory; O-D Matrix and Desire Line Diagram. Accident Studies & Mass Transportation : (i)Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

Unit – II

Trip Generation: Four Stage UTP Process; Travel Demand Models; Sequential Models and Direct Demand Models; Factors affecting Travel Demand; Trip Generation; Multiple Regression Analysis; Category Analysis; Aggregate and Disaggregate Models. TRIP Distribution: Trip Distribution Models- Growth Factor Models: Uniform Growth Factor, Average Growth Factor, Gravity Model – Calibration of Gravity Model.; Opportunity Models.

Traffic Assignment: Purpose of Traffic Assignment; Assignment Techniques-All-or- Nothing Assignment, Multiple Route Assignment, Capacity restraint assignment; Use of Diversion Curves in Assignment.

Unit –III

Mode Split: Factors affecting Mode Split; Pre-distribution Mode Split; Post- Distribution Mode Split; Advantages and Disadvantages; Probit, Logit and Discriminant Analysis in Mode Split. Land use and transportation system: Urban system components, Concept and definitions, criteria for measuring and comparing urban structure, land use and transportation.

Unit – IV

Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads. Flexible Pavements Design: Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, Group Index method, CBR method, IRC method, AASHTO method, Burmister's method and North Dakota cone method. Applications of pavement design software.

Unit –V

Rigid Pavements: Evaluation of sub grade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions. Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and expressways as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design.

Course Outcome:

- CO1 To understand Definition of Study Area; Zoning Principles; Types of Surveys: Home Interview Studies.
- CO2 To understand Four Stage UTP Process; Travel Demand Models; Sequential Models and Direct Demand Models, Factors affecting Travel Demand.
- CO3 To understand Factors affecting Mode Split; Pre-distribution Mode Split; Post- Distribution Mode Split; Advantages and Disadvantages
- CO4 To understand Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads.
- CO5 Evaluation of sub grade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements

Reference Books :

1. Adib Kanafani.(1983).Transportation Demand Analysis.Mc Graw Hill Series in Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.
3. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.
5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.
6. Yoder and Witczak, Principles of Pavement Design, John Wiley and Sons
7. W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co Academic Session 2016-17
8. Relevant IRC Codes
9. Bruton M J (1981), "Introduction to transportation planning", Hutchinson of London
10. Dickey J W(1980), "Metropolitan Transportation Planning", Tata McGraw Hill
11. Principles of Transportation Engineering : P. Chakraborty and A. Das
12. Fundamentals of Transportation Engineering: : C.S. Papacoastas
13. Traffic Engineering and Transport Planning:L.R. Kady



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BCE0834 Elective-V Disaster Risk Management Course Content

Course Objectives:

1. Introduce key concepts, terminology, and frameworks related to disaster risk management.
2. Equip students with the tools to identify, assess, and analyze risks associated with various types of disasters.
3. Enhance skills in communicating risk information effectively to diverse audiences.
4. Introduce modern technologies and data management tools used in disaster risk assessment and management.

Unit-I

Understanding Disasters: Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management

Unit-II

Types, Trends, Causes, Consequences and Control of Disasters: Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro- Meteorological Disasters (floods, cyclones, lightning, thunderstorms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters

Unit –III

Disaster Management Cycle And Framework: Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, Zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action.

Unit –IV

Disaster Management In India: Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter- governmental Agency

Unit-V

Applications Of Science and Technology For Disaster Management: Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and

Constructions Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India, Role of Engineers in Disaster Management

Course Outcome:

- CO1 Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability
- CO2 Understand the Geological Disasters (earthquakes, landslides, tsunamis, mining) ; Hydro-Meteorological Disasters.
- CO3 Understand the Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster
- CO4 Understand the Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis.
- CO5 Understand the Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System.

Reference Books :

1. Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
2. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
3. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
4. World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland
5. Encyclopedia of disaster management, Vol I, II and III Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006
6. Encyclopedia of Disasters – Environmental Catastrophes and Human Tragedies, Vol. 1 & 2, Angus M. Gunn, Greenwood Press, 2008
7. Disasters in India Studies of grim reality, Anu Kapur & others, 2005, 283 pages, Rawat Publishers, Jaipur
8. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006, 201 pages
9. Natural Disasters, David Alexander, Kluwer Academic London, 1999, 632 pages
10. Disaster Management Act 2005, Publisher by Govt. of India



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BCE0841 Elective-VI Stainable Design and Construction Course Content

Course Objectives:

1. Familiarize students with the fundamental concepts of sustainability in design and construction, including environmental, social, and economic considerations.
2. Teach various design strategies that minimize environmental impact, such as passive solar design, efficient use of materials, and site selection.
3. Introduce sustainable construction practices, including the use of renewable resources, waste reduction, and energy-efficient building techniques.

Unit -I

Housing Scenario: Introducing, Status of urban housing, Status of Rural Housing. b) Housing Finance: Introducing, Existing finance system in India, Government role as facilitator, Status at Rural Housing Finance, Impedimental in housing finance and related issues. (c) Land use and physical planning for housing: Introduction, Planning of urban land, Urban land ceiling and regulation act, Efficiency of building bye laws, Residential Densities.

Unit -II

Development And Adopting Sustainable Construction Technology: Introduction, Adoption of innovative cost effective construction techniques, Adoption of pre-cast elements in partial prefabrication, Adopting of total prefabrication of mass housing in India, General remarks on pre cast roofing/flooring systems, Economical wall system, Single Brick thick loading bearing wall, 19cm thick load bearing masonry walls, Half brick thick load bearing wall, Fly ash-gypsum brick for masonry, Stone Block masonry, Adoption of pre-cast R.C. plank and join system for roof/floor in the building.

Unit -III

Alternative Building Materials For Sustainable Construction: Introduction, Substitute for scarce materials, Ferro-cement- Gypsum boards, Timber substitutions, Industrial wastes, Agricultural wastes, cement-soil blocks for masonry, stabilized mud construction Low cost Infrastructure services: Introducing- Present status- Technological options- Low cost sanitation's Domestic wall- Water supply-energy.

Unit-IV

Housing The Urban Poor: Introduction, Living conditions in slums, Approaches and strategies for housing urban poor. Rural Housing: Introduction, traditional practice of rural housing continuous, Mud Housing technology, Mud roofs, Characteristics of mud, Fire resistant treatment for thatched roof, Soil stabilization, Rural Housing programs.

Unit-V

Construction In Disaster Prone Areas: Introduction, Earthquake, Damages to houses, Traditional Housing in disaster prone areas, Type of Damages of non- engineered buildings, Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions,

Requirements of structural safety of thin pre-cast roofing units against earthquake forces, Status of R&D in earthquake strengthening measures, Floods- cyclone, future safety.

Course Outcome:

CO1 To understand Status of urban housing, Status of Rural Housing.

CO2 To understand innovative cost effective construction techniques, Adoption of pre-cast elements in partial prefabrication

CO3 To understand the Substitute for scarce materials, Ferro-cement- Gypsum boards, Timber substitutions, Industrial wastes, Agricultural wastes.

CO4 To understand Living conditions in slums, Approaches and strategies for housing urban poor. Rural Housing

CO5 To understand Traditional Housing in disaster prone areas, Type of Damages of non-engineered buildings, Repair and restore action of earthquake Damaged

Reference Books :

1. Building materials for low-income houses – International council for building research studies and documentations.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Properties of Concrete – Neville A.M. Pitman publishing Limited- London.
4. Light weight concrete- Academic kiado- Rudhai .G – Publishing home of Hungarian Academy of Sciences 1963.
5. Low cost Housing – G.C. Mathur
6. Modern trends in housing in developing countries – A.G. Madhava Rao- D.S. Ramachandra Murthy & G.Annamalai.



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BCE0842 Elective-VI Waste Disposal & Management Course Content

Course Objectives:

1. Familiarize students with the fundamental concepts of sustainability in design and construction, including environmental, social, and economic considerations.
2. Teach various design strategies that minimize environmental impact, such as passive solar design, efficient use of materials, and site selection.
3. Introduce sustainable construction practices, including the use of renewable resources, waste reduction, and energy-efficient building techniques.

Unit- I

Solid Waste And Its Management: Introduction to solid waste-Definition of solid waste, garbage, rubbish-Sources and Types. Characteristics of Solid Wastes: Physical, chemical and biological characteristics. 3Rs- Reduction, reuse, recycling and recovery principles of waste management-Functional elements of Solid Waste management- Waste generation and handling at source-Collection of solid wastes- Collection methods and services- guidelines for collection route layout.

Unit- II

Waste Water And Its Management: Characteristics and analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Unit operations for waste water treatment, preliminary treatment.

Unit- III

Hazardous Waste And Its Management: Introduction to hazardous waste management issues, classification; Magnitude of problem; Risk assessment; Environmental Legislation; Characterization and site assessment; Waste minimization and resource recovery; Storage and Transportation of Hazardous wastes; Hazard in processing and treatment; Physical, Chemical, Thermal and Biological processes;

Unit- IV

Transfer And Transport Of Wastes: Solid Waste transportation: Transfer station- Processing and segregation of the solid waste- various methods of material segregation. Hazardous waste transportation: According to economic benefits, transfer stations, and types of hazardous waste.

Unit- V

Disposal Of Wastes Solid waste disposal: Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection. Hazardous waste disposal; Landfill disposal and land storage; Ground water contamination; Containment; remedial alternatives. Natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.

Course Outcome:

- CO1 To understand Solid Waste. principles of waste management- Functional elements of Solid Waste management
- CO2 Analysis of waste water, recycles of decomposition, physical, chemical & biological parameters. Unit operations for waste water treatment, preliminary treatment.
- CO3 To understand hazardous waste management issues, classification; Magnitude of problem; Hazard in processing and treatment; Physical, Chemical, Thermal and Biological processes;
- CO4 To understand Solid Waste transportation Hazardous waste transportation: According to economic benefits, transfer stations, and types of hazardous waste.
- CO5 Illustrate Solid waste disposal and classification-Design and Operation of landfills, Land Farming, Deep well injection. Hazardous waste disposal, Natural methods of waste water disposal

Reference Books:

1. Waste Water Engg. by B.C. Punmia - Laxmi Publication (P) Ltd. New Delhi
2. Environmental Engg. - M.L. Davis & D.A. Cornwell - Mc Graw Hill Company
3. Integrated Solid Waste Management by Tchobanogous
4. Environmental Engineering by Howard S. Peavy, Donald R. Rowe and George.
5. Hazardous Waste Management by Charles A. Wentz - - Mc Graw Hill Compan



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BCE0843 Elective-VI Geo-Informatics Course Content

Course Objectives:

1. Familiarize students with the principles, tools, and techniques of GIS, including data management, spatial analysis, and visualization.
2. Develop skills in analyzing spatial data, understanding spatial relationships, and applying statistical methods to geographic data.
3. Understand the design and management of spatial databases, including data storage, retrieval, and manipulation.

Unit-I

Basic Concepts Of Gis Basics Of Geographic Information System (Gis): Definition, Evolution & Components. GIS data input devices like scanner, digitizer, GPS, Remote sensing etc. Manual and semi-automatic line following digitization. Data Model: Raster Data Model, Grid, Tessellations. Spatial and attribute data visualization and query. Open GIS consortium, Customization in GIS, Object Oriented GIS, Web GIS, Introduction to popular GIS software like Arc GIS and QGIS.

Unit-II

Geo Informatics In Urban Mapping And Management: Remote sensing for detection of urban features. Introduction & basic terminology. Digital image processing techniques – Case studies. Segmentation of Built-up areas – Classification algorithms – Land use/ Land cover mapping – change detection – high resolution remote sensing – case studies. Mapping transportation network – Alignment planning – Traffic and parking studies – Accident analysis – case studies. Urban growth modeling – Expert systems in planning.

Unit-III

Basic Concepts Of Photogrammetry : History and development:- Types of aerial photo, Classification of aerial cameras, Scale, Overlaps, Stereoscopy, Concepts, Viewing and measuring systems, Image and object coordinates, floating mark, parallax equation, height information, Tilt, Rectification, Displacement. Flight planning, computation for flight plan, photo control, cost estimation, aerial mosaics, types. Concepts of interior, relative, absolute orientation, object, image relation, linearization, effect of orientation elements, scaling and leveling, analytical procedures, map compilation using stereo plotters. Introduction to digital photogrammetry, Elements of Aero triangulation and analytical method, strip and block adjustment, Terrestrial photogrammetry.

Unit -IV

GPS Surveying: Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datums, GPS receivers, GPS observation methods and their advantages over conventional methods.

Unit-V

Remote Sensing: Principle, components, classification, application on environmental engineering, hydrology and water resources, agriculture & forestry, disaster management. Microwave Remote

Sensing: Introduction, basic concepts, terminology and sensors in MWRS. Radar basics, radar interaction with earth surface ,geometry of radar images, radar return and image signature, resolution concepts.

Course Outcome:

- CO1 To understand GIS data input devices like scanner, digitizer, GPS, Remote sensing etc. Manual and semi-automatic line following digitization
- CO2 To understand Remote sensing for detection of urban features. Introduction & basic terminology
- CO3 To understand History and development:- Types of aerial photo, Classification of aerial cameras, Scale, Overlaps, Stereoscopy, Concepts
- CO4 To understand Introduction & components of GPS, Space segment, control segment and user segment.
- CO5 To understand Principle, components, classification, application on environmental engineering, hydrology and water resources , agriculture & forestry, disaster management

Reference Books:

1. Plane Surveying- A. M. Chandra, New Age International.
2. Surveying and Leveling-Part-I & IIT- P. Kanetkar and S. V. Kulkarni, Vidyarthi Griha Prakashan.
3. Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems- Gottfried Konecny, CRC Press
4. Elements of Photogrammetry- Paul R. Wolf, McGraw Hill
5. Photogrammetry, Vol 1&II - Karl Kraus, Walter de Gruyter
6. Remote Sensing and image interpretation- Lillesand T.M. and Kiefer R. W., Wiley.
7. Introduction to remote sensing - J. B. Campbell, John Wiley.
8. Introductory digital image processing- J. R., Jensen Prentice Hall.
9. Remote Sensing in Civil Engineering- Kennie, T. J. M. and Matthews M. C., Surrey University Press.
10. GPS satellite surveying- Alfred Leick, Wiley
11. GPS Theory, Algorithms and Applications- Guocheng Xu, Springer
12. Microwave remote sensing vol-1, vol-2- Ulaby, F.T., Moore, K.R. and Fung, Artech House Publishers.
13. Principles and applications of Imaging - Floyd. M. Handerson Anthony, J. Lewis, Wiley.
14. Air and space borne radar systems-An introduction- Philippe Lacomme and Eric Normant, Elsevier.
15. Introduction to microwave remote sensing- Iain H. Woodhouse, CRC Press
16. Satellite Remote Sensing for Hydrology and Water Management- Eric C. Barrett, Clare H. Power, Taylor & Francis Ltd
17. Hydrologic and Hydraulic Modeling Support with Geographic Information



SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Course: B. Tech.

Branch: Civil Engineering

Semester: VIIIth

Academic Session: 2024-25

w.e.f - Date-02-09-2024

BCE0844 Elective-VI Finite Element Method

Course Content

Course Objectives:

1. Learn to formulate problems in terms of partial differential equations and understand the process of deriving the finite element equations.
2. Understand how to apply various types of boundary conditions in finite element models.
3. Learn how to interpret and visualize results from FEM simulations effectively.
4. Understand the concepts of convergence, stability, and error estimation in finite element solutions.

Unit-I

Introduction To Finite Element Method: General applicability and description of finite element method, comparison with other methods.

Unit-II

Solution Of Finite Element Method: Solution of equilibrium problems, eigen value problems, propagation problems, computer implementation of Gaussian eliminations, Choleskis decomposition, Jacobis and Ranga- Kutta method.

Unit-III

General Procedure Of Finite Element Method: Descretization of the domain, selection of shapes, types and number of elements, node numbering technique, interpolation, polynomials, their selection and derivation in terms of global and local coordinates, convergence requirements. Formulation of element characteristic matrices and vectors, variational approach.

Unit-IV

Iso-Parametric Formulation: Lagrange and Hermite interpolation functions, iso- parametric elements, numerical integration.

Unit-V

Static Analysis: Formulation of equilibrium equation, analysis of truss, frames, plane stress and plane strain problems.

Course Outcome:

CO1 To understand finite element method, comparison with other methods.

CO2 To understand Solution of equilibrium problems, Eigen value problems, propagation problems.

CO3 To understand descretization of the domain, selection of shapes, types and number of elements, node numbering technique.

CO4 To understand Lagrange and Hermit interpolation functions, iso- parametric elements, numerical integration.

CO5 To understand Static analysis Formulation of equilibrium equation, analysis of truss, frames, plane stress and plane strain problems.

Reference Books:-

1. Weaver, Johnson, Finite element and structural analysis
2. HC Martin, Matrix structural analysis
3. CF Abel, CS Desai, Finite element methods
4. Buchanan, Finite element Analysis (Schaum Outline S), TMH
5. Krishnamurthy, Finite element analysis, TM



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BCE081P Advance Structural Design –II (STEEL) Lab

List of Experiment

1. Design of plate girder using STAAD Pro.
2. Design of gantry girder using STAAD Pro.
3. Field/site visits.
4. Design of Water tank using STAAD Pro

List of Equipment/Machines/Instruments/Tools/Software Required:

1. Latest Release of Software Package STAAD Pro (Research Engineers International, Kolkata)
2. Latest Release of Software Package STAAD.etc (Research Engineers International, Kolkata)

Reference Books:

- 1.Users Manuals for STAAD Pro Software.
- 2.Users Manuals for ANSYS Software.



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BCE082P Geotechnical Engineering – II Lab

Laboratory Work:

Laboratory work will be based on the course of Geotechnical Engineering. I & II as required for soil investigations of engineering projects and not covered in the lab. Work of Geotechnical Engineering.

List Of Experiments:

1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. Determination of field density by Core Cutter Method
4. Determination of field density by Sand Replacement Method
5. Determination of field density by Water Displacement Method
6. The corifiled Compression Test
7. Tri axial compression test
8. Lab. Vane Shear test
9. CBR Test
10. Demonstration of Plate Load Test SPT & DCPT



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DCE085P Major Project –II Lab

Course Outcome:

1. **Introduction** : Importance of project work, guide line and general introduction
2. **Selection Of Project** : The project can be selected from any four civil engineering system like Building construction system, transportation engineering system, irrigation engineering system. A topic for project can also be selected on recent development in civil engineering.
3. **Planning Of Project** : Planning of field work, line of action, work distribution, data to be collected by different batches. projects to be undertaken by a group of 4 to 6 students.
4. **Preparation & Implimentation On Project Work.**
5. **Deatiled Presentation**
6. **The Project Report Shall Be In The Following Format:**
 - Topic and objectives
 - Collection of data, required survey work,
 - Management and construction procedure
 - Resources scheduling and networking
 - Design details
 - Required drawing set
 - Utility to society if any
 - Conclusion

List Of Civil Engineerng Projects:

1. Design of Check Dam/Stop Dam.
2. Study of G Dam (Earthen/Gravity)
3. Micro irrigation –Drip/Sprinkler Irrigation.
4. Junction planning for city roads/planning for roads for congested area/parking
5. Studies etc.
6. Rain water harvesting for domestic or public building.
7. Campus development.
8. Interior decoration.
9. Concrete mix design.
10. Solid waste management.
11. Hospital waste disposal.
12. Recycling of resources.
13. Manufacturing of Pre cast concrete products.
14. Prestressed concrete.
15. Planning Estimating and design for residential apartments/commercial complex.

16. Planning and design of water treatment plant for given data.
17. Planning and design of water supply scheme for given lay out.
18. Planning and design of sewage treatment plant for given data.
19. Planning and design of sanitary scheme for given layout.
20. Intelligent & green building material.

Term Work: Shall consist of -- Detailed project report in above format. Separate drawing sheets covering details of the project shall also be prepared



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BCE086P Non-Destructive Testing (NDT) Lab

List of Experiment:

1. Ultrasonic testing (UT): Uses high-frequency sound waves to detect flaws and measure dimensions
2. Radiographic testing (RT): Uses film or a digital detector to create images that can be examined for damage or flaws
3. Magnetic particle testing (MT): Uses magnetic particles to detect flaws in magnetizable materials
4. Liquid penetrant testing (PT): Applies a coating of liquid with a fluorescent or visible dye to an asset
5. Visual testing (VT): A conventional NDT technique
6. Acoustic emission testing (AE): Uses acoustic energy bursts to identify potential defects
7. Eddy current (electromagnetic) testing (ET): A type of NDT testing
8. Leak testing (LT): A type of NDT testing



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BCE087P Group Discussion

Topics for Group Discussion

1. Urban Design
2. Advance Construction Techniques
3. Advanced Earthquake Resistant Techniques
4. Evacuation Patterns in High-Rise Buildings
5. Fibre Reinforced Concrete
6. Solar Building
7. Concrete Repair and Structural Strengthening
8. Carbon Fibre Use in Construction
9. Bio Diesel
10. Hydrology
11. Hazardous Waste Management
12. Submerged Floating Tunnels
13. Disaster Management
14. Suspension Bridges
15. Highway Network Management
16. Pavement Design
17. Bamboo as a Building Material
18. Low-Cost Housing
19. Canal Irrigation
20. Rainwater Harvesting
21. Nanotechnology in Civil Engineering
22. Parking Problems
23. Transparent Concrete
24. Cyclone Resistant Building Construction
25. High-Performance Concrete.